

# Preface

Space exploration and activities requires new methods and technologies and often involve autonomous and robotics operations. The beginning of space exploration involved several automatic missions to inner and outer planets, as well as to our Moon. The applications of robots in space make many operations not only possible but also safe.

The human participation in Space exploration is often a reflection of our interest and curiosity in Cosmos and our surrounding World. Long distances between planets make human participation difficult, involving high risk or simply impossible. Therefore, automatic and robotic missions are destined to play a leading, ever increasing role in Space exploration.

Robotics in Space could perform three different roles: automatic exploration missions, mobile robots or rovers and robotics manipulators.

Automatic exploration missions involve spacecraft probes. In some missions, where landing at the other planet is planned, the spacecraft probe is designed as a lander equipped with robotic arm. The lander is stationary and does not move but has capabilities to collect ground and rock samples with robotic arm.

Mobile robots or rovers are robotic vehicles designed to explore surfaces of planets. Rovers could be autonomous or controlled remotely from its Control Centre. Such robots navigate across a planet, stop in numerous places of interest to investigate, take images and collect samples.

Robotic manipulators in Space perform very important role of handling parts, materials or minerals. Very often the manipulators are used for assembly (e.g., Space Station assembly operation) or handling spacecraft in and out of orbit. Space manipulators allow astronauts to perform their mission in orbit by lifting and carrying them at the tip of manipulator. Space manipulators play important role in handling materials around the Space Station and help in supplying, resupplying and building new modules for Space Station.

Poland has been developing its space capacity and expertise since 1970. The long pursued goal of joining European Space Agency was achieved in 2012, thus opening Polish Space community the door to participating in technologically advanced endeavours of the Agency. Space robotics belongs to the core of ESA activities in the exploration program and paves the way to future human missions to Mars. Poland can contribute significantly to ESA unmanned exploration projects

building on the long tradition of research in general robotics, recognised expertise of many Polish scientific groups, young generation of scientists, engineers, specialists, and finally, on interest of many technical universities in Poland in extending their field of research to space.

From this perspective, consolidation of robotics and space communities in Poland is a natural process and should be realised by participation in joint projects, broad international cooperation and in the first place, through scientific meetings and conferences.

In recognition of important role of robotics in Space, a special, dedicated Workshop on ‘Space Robotics’ was held in the Research Space Centre PAN in Warsaw, June 3–5, 2011.

This book is addressed to broad robotics and space community and will be of interests to scientists and researchers working in those fields.

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